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Vol. X MAY, 1940 No. 5

STUDIES ON GROWTH AND DEVELOPMENT OF ADOLESCENTS AND THEIR IMPLICATIONS FOR THE HEALTH PROGRAM OF THE ADOLESCENT*

WILLIAM WALTER GREULICH, Ph.D.

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The life of the individual human being is a continuum which begins at the moment of its conception and ends with its death. The normal life span may be considered as divisible roughly into three epochs: the first, which extends from conception until well into the third decade of life, is the time required to attain adulthood; the second is the variable, but usually very brief, period during which the individual enjoys the peak of his physical efficiency; and the third is the period of physical deterioration — a process which begins insidiously as early as the late twenties and, gathering speed as the years go by, effects his eventual senility and dissolution. Viewed in this way, it appears that the first twenty-odd years of life are spent in achieving physical maturity and a degree of physiological equilibrium which is lost, at least in part, almost as soon as it is attained. If this seems an exaggerated statement, I would remind you of the common observation that the baseball player is usually well past the peak of his efficiency at thirty and that the pugilist's legs have already begun to slow him down some years earlier. It is, then, perhaps not too much to say that man has scarcely begun to live when he begins to die.

We need not dwell longer on this morbid note, nor need it unduly distress us; for, after all, there are still some pleasures left in life after most of the agility of youth has been lost. I give you this concept merely because it serves to put into a somewhat clearer perspective that particular period of life, adolescence, about which I have been asked to talk to you.

Adolescence begins early in the second decade and is usually considered as ending at about the twenty-second or twenty-third year in boys and somewhat earlier in girls. It covers, therefore, approximately the last ten years of what I referred to previously as the first epoch of life, the period extending from conception to adulthood. The physical changes which occur during this early

*Read before the American School Health Association, and the Child Hygiene, and Public Health Nursing Sections of the American Public Health Association, on October 19, 1939, at Pittsburgh, Pa.

**Since February 1, 1940, Brush Foundation, Western Reserve University, School of Medicine.

period of life involve both growth and development: growth, in the sense of an increase in mass, volume, and external dimensions; and development, in the sense of becoming progressively more complex. Now, these two processes, growth and development, do not proceed at the same absolute rate, or at the same relative rate throughout this early period of life. There are intervals during which the body is increasing in size more rapidly than it is growing in complexity, and there are other times at which this relationship is reversed. The physical changes which occur during adolescence are, perhaps, best appreciated when viewed in the light of the events which have preceded them. Let us, therefore, consider briefly some of the more conspicuous physical changes which have occurred in the child by the time adolescence begins.

I want to digress at this point to tell you a story. A Kindergarten teacher whose class had spent some days drawing and cutting out pictures of various animals, decided to test the children's power of observation. She asked her class: "What do elephants have that no other animals have?" The little girl who volunteered to answer the question did not say, "A trunk." as the teacher had hoped she would, but, instead, replied, "*Little* Elephants." The child was wise beyond her years, for she had hit upon an aspect of the matter which is so obvious that it usually escapes her elders.

When we speak of things which are determined by heredity in the human body, such traits as eye-color, hair color, hair form, skin color, or such defects as hemophilia, red-green color blindness, etc., suggest themselves. We are likely to lose sight of the fact that, in addition to determining a vast number of what may more or less properly be called unit characters, such as those I have just enumerated, there is also in the germ plasm some mechanism which controls larger aspects of development and which insures, for example, that human beings give rise only to other human beings and that elephants continue to produce only elephants.

The genetic constitution of man, as well as that of other forms, controls another important aspect of development. Not only does it determine within rather narrow limits what the end-product of development will be, but it also prescribes quite definitely the stages to be followed in attaining that end. One expression of such genetic control is seen in the human growth pattern, a consideration of which will return us to the principal theme of this paper.

Most of the existing information on the human growth pattern is based on cross-sectional data which take the form of average heights and average weights of boys and of girls of various chronological ages. The values are usually obtained in this way: An investigator measures and weighs a reasonably large number of boys and girls of say, six years of age, and determines the average weight and the average height for each sex. He then measures and weighs an approximately equal number of boys and girls of seven

years of age and determines the corresponding average values for them. The same procedure is used for other age groups, and the investigator eventually emerges with figures, which when translated into tables and graphs, are very impressive and are rather generally accepted as a faithful delineation of the human growth pattern. Data of this kind have proved to be of considerable practical value. They suffer, however, from some disadvantages which are inherent in the method of their collection. I shall call attention to some of those disadvantages as we proceed. Let us, first, consider an example of a pattern of human growth which is based on such cross-sectional data.

Figure 1 shows graphically the average standing heights of boys and girls for each year from birth to 20 years of age. The average heights of the boys are shown in solid black, while that of

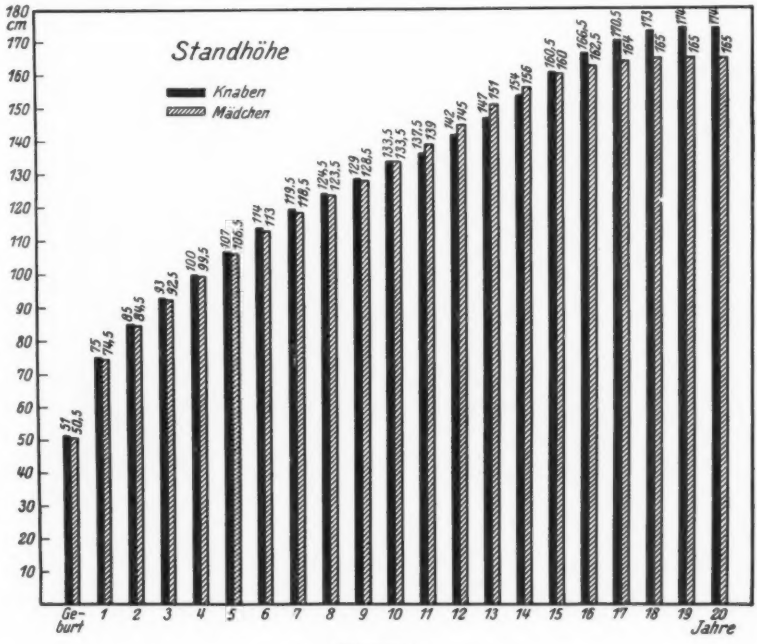


Figure 1.
Average standing heights of boys and girls from birth to 20 years.*

the girls are represented by cross-hatching. This figure is taken from the paper by Dr. W. Pfuhl in Peter, Wetzel, and Heiderich's Handbuch der Anatomie des Kindes[1]. I have chosen these German

[1]Peter, Karl, Wetzel, Georg, and Heiderich, Friedrich. Handbuch der Anatomie des Kindes. Band i, Lfg, 2, Munich, J, F. Bergmann. 1928

data rather than comparable data from this country because they are based on a somewhat more homogeneous population than our own. The observed average standing heights for the boys and for the girls are recorded separately for each age group. It will be noted that boys are somewhat taller (longer) than girls at birth and that they maintain this superiority up to about age 10, at which time the girls equal the boys in stature. From 11-14 the girls are taller than the boys, but by age 15 the boys have grown slightly taller than the girls. This superiority in stature increases during the next four years and is maintained thereafter.

Figure 2, from the same source, shows the average weight in kilograms of the same group of boys and girls from birth to 20 years of age. It will be noted that whereas at age 11 the average height of girls is about 1.5 centimeters greater than that of the

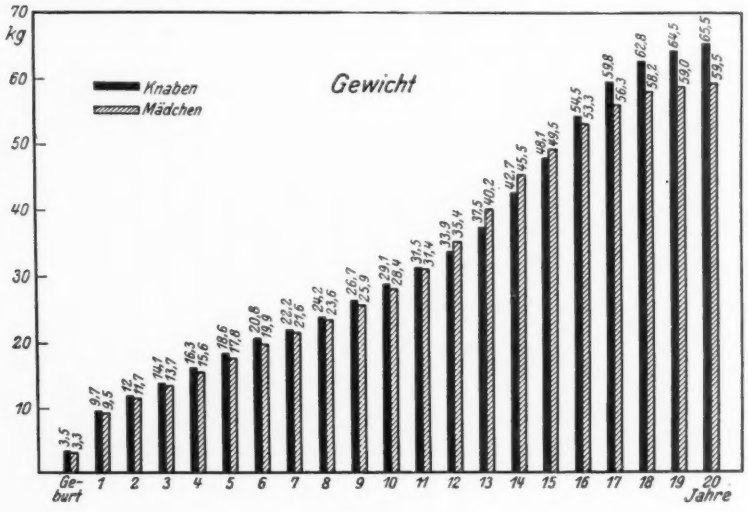


Figure 2.
Average weights of boys and girls from birth to 20 years.*

boys, the boys still remain slightly heavier than the girls. The reverse is true at age 15, at which time the boys again exceed the girls in height, though they are still surpassed by them in weight.

The pattern of growth is shown somewhat more clearly in Figures 3-a and 3-b, in which the average annual increments in height and in weight, rather than the absolute heights and the absolute weights are represented graphically. Average heights and average weights alone give, of course, no information about the range of variability as regards these two aspects of growth in the group from which the data were derived. Such averages, there-

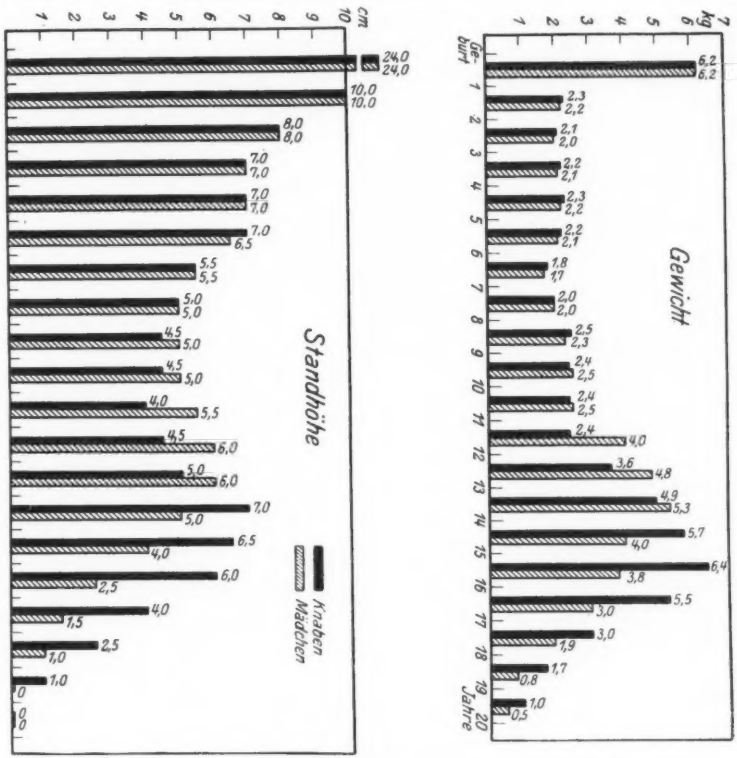


Figure 3a.
Average increments in standing height of boys and girls from the 1st through the 20th year.*

Figure 3b.
Average increments in weight of girls and boys from the 1st through the 20th year.

fore, tend to obscure individual differences which become apparent when one compares the growth pattern of individual children. A study of individual growth curves discloses that all boys do not have their maximum spurt of growth at the same age; and that girls also show similar differences. This fact is well illustrated in Figures 4 and 5, taken from Shuttleworth's monograph[2], which is based on the data from the Harvard Growth Study.

[2]Shuttleworth, F. K. Sexual Maturation and the Physical Growth of Girls, Age Six to Nineteen. Monographs of The Society for Research in Child Development. Vol. 2, No. 5, Washington, D. C., 1937.

*Figures 1, 2, and 3 are from Peter, Wetzel and Heiderich's *Handbuch der Anatomie des Kindes.* They are reproduced, here, by the kind permission of the publishers, Julius Springer, of Berlin.

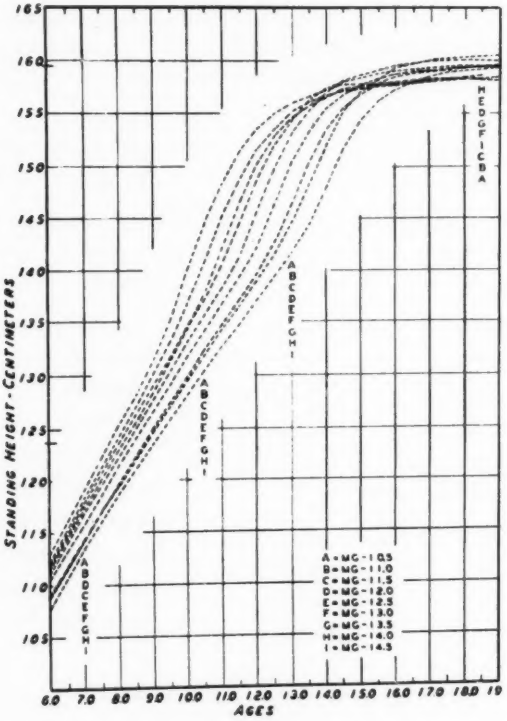


Figure 4.
Growth trends in average standing height of 9 groups of girls having different ages at maximum growth.**

Figure 4 depicts growth trends in average standing height of nine groups of girls having different ages at maximum growth. Figure 5 shows similar differences in ten groups of boys. It will be noted that there is a considerable range in the average standing height of the girls between about 10 and 14 years of age and a somewhat comparable range in the average standing height of the boys between about 13 and 17. Obviously, a single average height for either the boys or for the girls at any one age within those periods would be much less representative of the group, than would their average heights at 7 or 8 years of age, when there is a much smaller range in their stature.

We have seen an example of a growth pattern based on average increments in height and weight observed in groups of children of different ages. It should be emphasized that these were *different* children in each age group — not the *same* children weighed and measured on successive years. We have seen, also, that there is

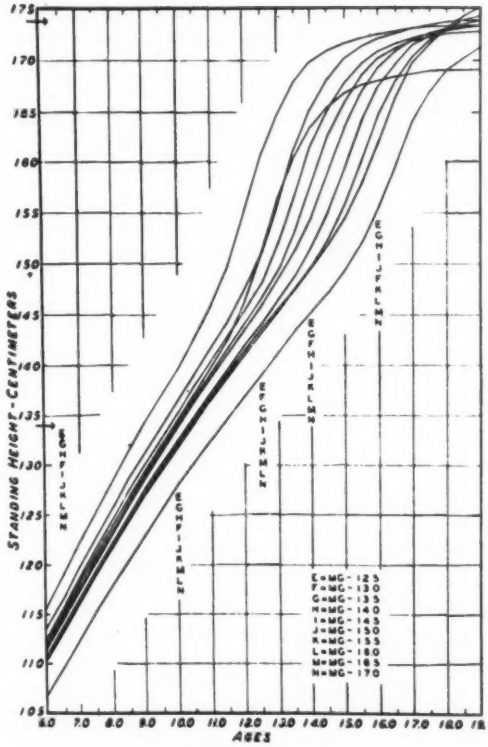


Figure 5.
Growth trends in average standing height of 10 groups of boys having different ages at maximum growth.**

considerable variation as regards the age at which the so-called pre-adolescent spurt of growth occurs in different children and that the resulting variability must be taken into account when interpreting reported *average* heights and *average* weights of children in that age group. Since such variability occurs even among children of the *same* racial stock, it is not surprising to find an even greater variability among adolescent children in a population as heterogeneous racially as that of many parts of our country. These facts should make us realize the limitations of the various height-weight standards when applied to adolescent children.

We have been considering the *growth* of children—specifically, the amount that they increase in height and weight from year to year. Let us turn now to a consideration of those *developmental* changes which begin to manifest themselves early in the second

decade of life and which have come to be recognized as representing successive stages in the child's progress towards maturity.

These maturative changes are believed to be initiated and, in part, maintained by hormones produced by the anterior lobe of the pituitary gland. Two of those hormones are of especial interest in this connection. The first is the growth hormone, which enables the adequately nourished child to attain its maximum normal body size. In the absence of an adequate amount of this hormone, normal growth does not occur and a form of pituitary dwarfism results. If an excessive amount of growth hormone is produced by the pituitary gland of a child or a young adult, pituitary gigantism ensues.

The second pituitary hormone of importance in maturation is the gonad-stimulating, or gonadotrophic, hormone. In children, just before the onset of puberty, this hormone begins to be produced in a quantity sufficient to cause their immature gonads to grow and eventually to develop into mature ovaries or testes. This same hormone helps to sustain the functional integrity of the ovaries and testes throughout the individual's reproductive life. An inadequate production of gonadotrophic hormone in the pre-adolescent child prevents the normal growth and development of the ovaries or testes, and, indirectly, that of the other reproductive organs as well, and results in a hypogonadal condition, in which the primary sexual characters remain in an almost infantile state and the various secondary sexual characters fail to develop properly. The presence of an excessive amount of this gonadotrophic hormone in early life produces one type of precocious sexual development.

Once the gonads have begun to develop in response to the gonadotrophic hormone of the pituitary gland they begin to produce hormones of their own in significant quantities: the ovary produces the so-called female sex hormone, theelin or estrone, and later, corpus luteum hormone, progesterone; the testes produce the so-called male hormone, probably in the form of testosterone. The female hormone stimulates the growth of the breasts, the mammary glands, the uterus, the Fallopian tubes, the vagina and various secondary sexual characters proper to the female. The male hormone similarly stimulates the growth and development of the prostate gland, the seminal vesicles, the penis and associated structures, as well as the male secondary sexual characters—the growth of the beard, deepening of the voice, etc.

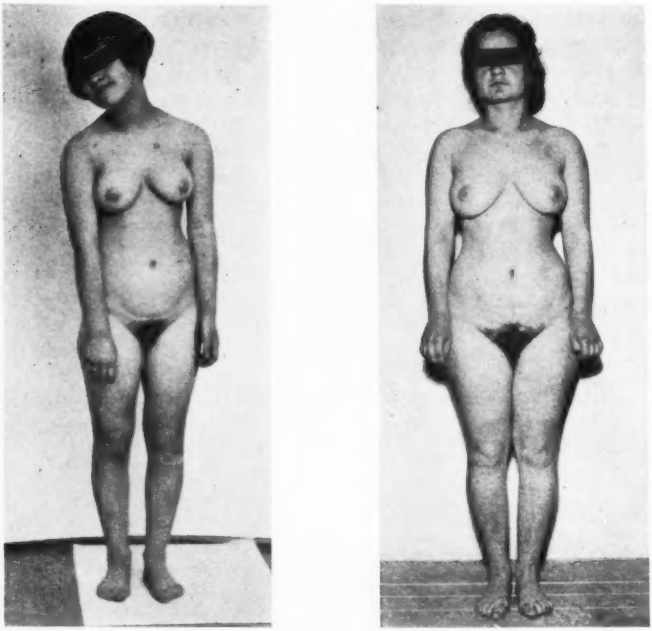
Both the male and female hormones have another important function: They act upon the pituitary gland, and seem to cause a gradual reduction in either the amount or the effectiveness of the growth hormone produced by that gland and eventually stop its action completely. We noted previously that the pituitary gland must produce an adequate amount of growth hormone at the proper time, if the child is to grow normally. It is equally true that the child's gonads, its testes or ovaries, as the case may be, must pro-

duce a sufficient quantity of their own hormones if growth is to *cease* at the proper time. If the testes or ovaries begin to function at the requisite level too early in life, growth is arrested prematurely and the child ends up abnormally short. If, on the other hand, the adequate production of the ovarian and testicular hormones is unduly delayed, growth, particularly that of the limbs, continues for too long a period and the characteristic body proportions of the eunuch are attained. It appears, therefore, that normal growth and development is contingent upon the reciprocal and properly timed action of pituitary and gonadal hormones. The validity of this hypothesis has been conclusively verified by countless experiments on animals. In this, as in so many cases, nature has anticipated man's experiments by making some of its own *on man*. Let us look at the result of some of nature's tragic experiments in this field.

In 1923, Thoms and Hershman[3] described a case of sexual precocity in a girl three years, eleven months of age. When she was about one year old, it had been noticed that her breasts were larger than normal and when she was three years and seven months old, she menstruated for the first time. Figures 6, 7, and 8, show the

Figure 6

[3]Thoms, H. and Herschman, A. A. A Case of Sexual Precocity. American Journal of Obstetrics and Gynecology, Vol 6, No. 3, September, 1923.



Figures 7 and 8
Thoms and Hershman's case of sexual precocity at 3 years, 11 months; 8 years, 6 months; and 18 years, respectively.†

appearance of this child at three years, eleven months; eight years, six months; and at eighteen years, respectively. It will be noted that, at the age of eight and one-half years, she had the physical development and the bodily configuration of a mature woman. She died in her nineteenth year, following a second operation for the removal of a cerebellar tumor.

At the time that the earliest photograph was made, when she was three years, eleven months old, she was 42 inches high and weighed 50 pounds. Thoms and Hershman describe her physical appearance as follows:

> "The physical examination of the head, neck, chest, abdomen, and extremities, reveals nothing abnormal. The breasts are those of a woman. The primary areola is well differentiated, the nipples well defined. There is no secretion. There is no axillary hair. The pubic hair is moderately thick and covers the pubes. The external genitalia show the labia to be well developed. No internal examination has been made . . . X-ray examination of the wrists disclosed, besides the centers normally present at this age, the trapezoid, the pisiform, and the styloid process of the ulna."

During normal puberty, the development of the breasts is among the earliest external manifestations of beginning sexual

†Figure 7 is reproduced here by permission of Dr. Arnold Gesell, of the Yale University Clinic of Child Development.

maturation, and the breast changes are usually well under way before the pubic hair appears in any considerable quantity. The growth of axillary hair usually begins after the pubic hair is fairly well developed, and is ordinarily preceded by the menarche, the first menstruation. It is interesting to note that, although in precocious puberty all of these changes occur abnormally early, the order in which they appear is substantially the same as that observed in normal puberty.

Children in whom puberty occurs precociously end up small in stature. This is understandable, in the light of what was said earlier in this paper about the action of the gonadal hormones in suppressing the production of pituitary growth hormone. In these cases the gonadal hormones are produced abnormally early in quantities sufficient to suppress growth before the normal adult stature has been attained. It was also mentioned earlier that the absence of adequately functioning gonads during childhood results in a lack of sufficient gonadal hormones to suppress the production or the effectiveness of the pituitary growth hormone. Under such conditions, growth continues for an abnormally long period and the individual ends up quite tall, with disproportionately long limbs and with other typically eunuchoidal bodily proportions.

We have considered two contrasting effects of gonadal hormones on physical growth and development. It should not be implied that the gonadal and pituitary hormones are the only factors involved in the processes of growth and development. If the latter are to proceed normally, however, it is essential that those hormones be present in adequate quantities at the proper time. Let us consider, next, the influence of these hormones on the growth and development of normal girls.

Figure 9 shows individual growth curves of 10 girls whose first menstruation occurred between 10 years, 7 months and 11 years, 3 months and of 10 girls whose first menstruation occurred between 14 years, 5 months and 15 years, 2 months. I wish to direct attention to several points which are illustrated in the figure. It will be noted, first, that the girls who attained menarche at the younger age were, on the average, taller during the period from about eight and one-half to twelve years, than were those in whom menarche occurred later. The girls in the late menarcheal group, however, continued to grow after the growth of the girls in the other group had practically ceased, and ended up taller than the others. These curves show also that the rate of growth in stature decelerates rapidly after the menarche. The menarche indicates that the girl has begun her progress toward sexual maturity and that the quantity of ovarian and other hormones in her blood has increased to a point at which the necessary changes in the uterus which precede and accompany menstruation are evoked. Once that level of ovarian activity has been attained, the growth-stimulating

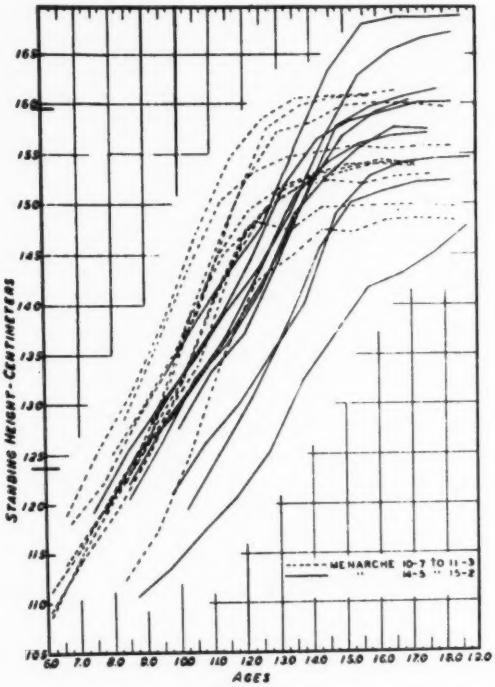


Figure 9.

Individual growth curves in standing height, plotted to exact ages, of 10 girls attaining menarche between ages 10 years, 7 months and 11 years, 3 months (broken lines) and of 10 girls attaining menarche between ages 14 years, 5 months and 15 years, 2 months (solid lines).**

action of the pituitary gland is diminished and the rate of growth rapidly decreases. This sequence of events is the same as occurred in the case of precocious puberty described above. That girl was quite large for her age before her first menstruation, but she ended up very small in stature because the gonadal and other changes associated with her sexual maturation were initiated and completed abnormally early. The relation between the menarche and the deceleration of the growth curve is strikingly shown in Figure 10, which is based on annual increments in standing height of eight groups of girls who attained menarche at different ages. The curves are arranged so that the points corresponding to the age at menarche are in the same vertical plane.

It might be well, at this point, to discuss briefly the rather widespread belief that the menarche necessarily indicates the at-

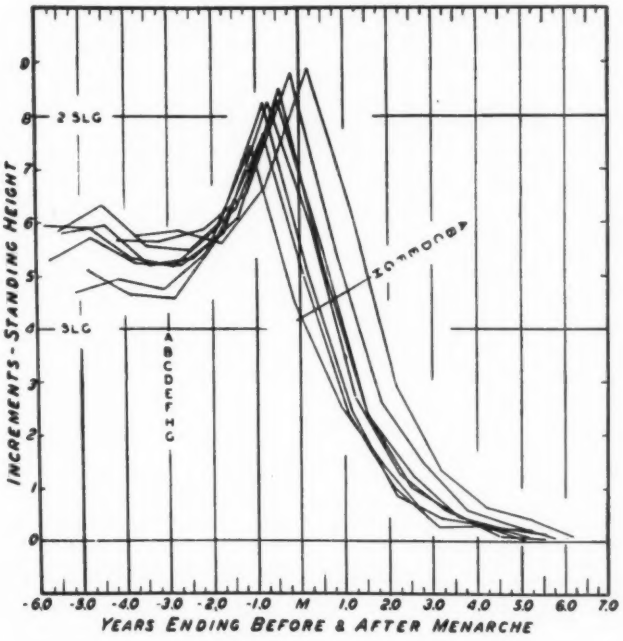

INCREMENTS - STANDING HEIGHT
2 SLG
SLG
A B C D E F G
Common
-6.0 -5.0 -4.0 -3.0 -2.0 -1.0 M 1.0 2.0 3.0 4.0 5.0 6.0 7.0
YEARS ENDING BEFORE & AFTER MENARCHE

Figure 10.
Annual increments in standing height of 8 groups of girls who attained menarche at different ages. The curves are arranged so that the points corresponding to the menarcheal age are on the same vertical line.**

tainment of a degree of sexual maturity which makes reproduction possible. It is probably incorrect. Hartman[4] has shown that in the puberal Macque the proportion of ovulatory as compared with non-ovulatory cycles is very low, and that in that animal approximately one year elapses between the first menses and the first conception, despite frequent matings in the interim. Yerkes[5] reported that a chimpanzee in his colony did not become pregnant until about thirteen months after her first menses, although she had been caged with a fertile, adult male continuously throughout that period. Evidence of a similar lack of the degree of maturity necessary for conception in puberal mice has been advanced by Mirskaia[6] and

[4]Hartman, C. G. On the Relative Sterility of the Adolescent Organism. Science, 74. 226-227. 1931.
[5]Yerkes, R. M. A Second-Generation Captive-Born Chimpanzee. Science, 81. 542-543. 1935.
[6]Mirskaia, L. and Crew, F. A. E. Maturity In the Female Mouse. Proceedings of the Royal Society of Edinburgh, 50. 179-186. 1930.
**Figures 4, 5, 9, and 10 are from Shuttleworth's, *Sexual Maturation and Physical Growth of Girls, age six to nineteen* and are reproduced here through the courtesy of the Society for Research in Child Development.

Crew. That the menarche may be associated with a comparable degree of sexual immaturity in girls is suggested by the fact that in some primitive societies in which rather promiscuous sexual relations are permitted among adolescents the girls involved are said rarely to become pregnant during that period. (Malinowski[7] and Ashley-Montagu.[8]) This assumes, of course, that the adolescent boys involved are sufficiently mature to be producing normal spermatozoa in adequate quantities, and evidence is lacking on that point. In view of these facts, it would seem best, therefore, to regard the menarche as neither a dependable criterion of maturity nor as necessarily the expression of any narrowly circumscribed stage of sexual maturation. It is, rather, the reflection of a physiological state which may occur at different times during the puberal period in different individuals, but which usually precedes by a considerable interval the attainment of the capacity to reproduce.

The fact that the maturative changes, in both boys and girls, are initiated at different chronological ages should be of especial interest to educators and others who deal with adolescent children. A classroom of children of about the same chronological age will, for example, often include some who are quite immature physically and others who are already well on the way towards maturity. The

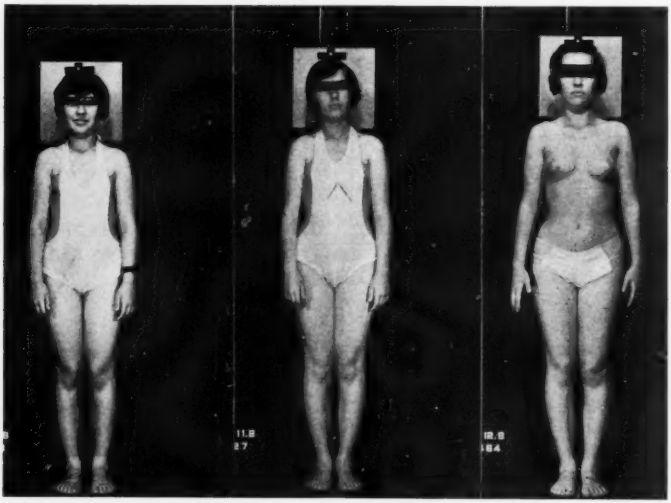


Figure 11a.
An early maturing girl at 10 years, 8 months; 11 years, 8 months; and 12 years, 8 months.

[7]Malinowski, B. The Sexual Life of Savages. New York, Horace Liveright, 1929.

[8]Ashley-Montagu, M. F. The Adolescent Sterility Period in Man. American Journal of Physical Anthropology, 21 (supplement 13), 1936.

photographs reproduced in Figure 11 give some idea of the amount of difference which can exist in the developmental status of normal children of the same chronological age.

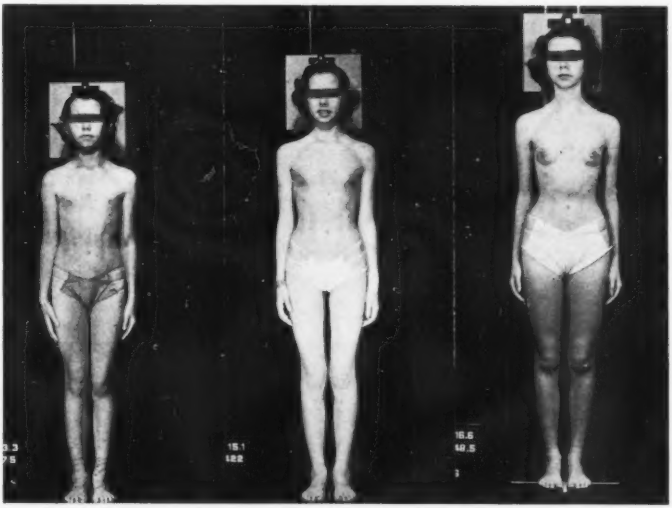


Figure 11b.
A late maturing girl at 13 years, 3 months; 15 years, 1 month; and 16 years, 6 months.

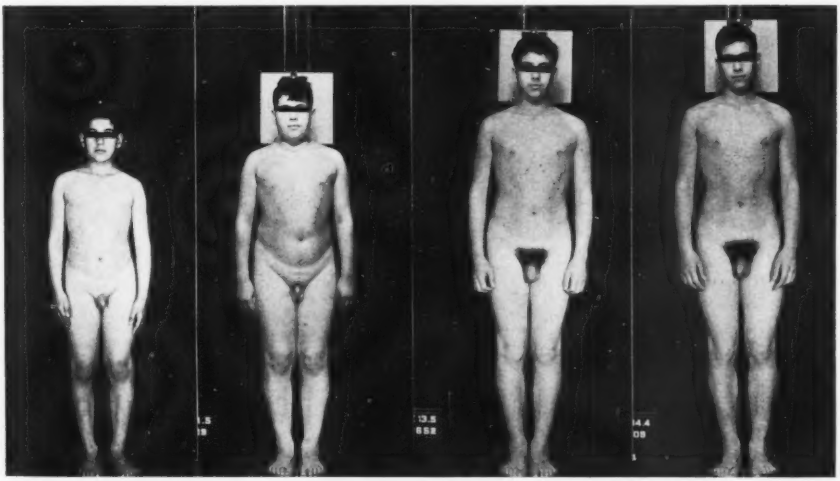


Figure 11c.
An early maturing boy at 9 years, 9 months; 11 years, 5 months; 13 years, 5 months; and 14 years, 4 months.

We have considered the human growth pattern, some limitations of height-weight-age tables based on group averages, the relation of pituitary and gonadal hormones to growth and development, the probable value of the menarche as a criterion of sexual maturity, and, finally, the degree of variability in the developmental status of children of the same chronological age, during adolescence.

The available time does not permit an adequate discussion of the implications of these facts of development for a health program for adolescents. I should not attempt such a discussion, even if there were time to do so; for those implications are, I am sure, quite obvious to all of you. I have, therefore, limited myself to this sketchy and, admittedly, incomplete account of some of the physical changes which occur during adolescence. If, by it, I have succeeded in adding significantly to your knowledge of that most interesting, and quite unpredictable, animal, the adolescent child, I shall feel justified in having inflicted this paper upon you.

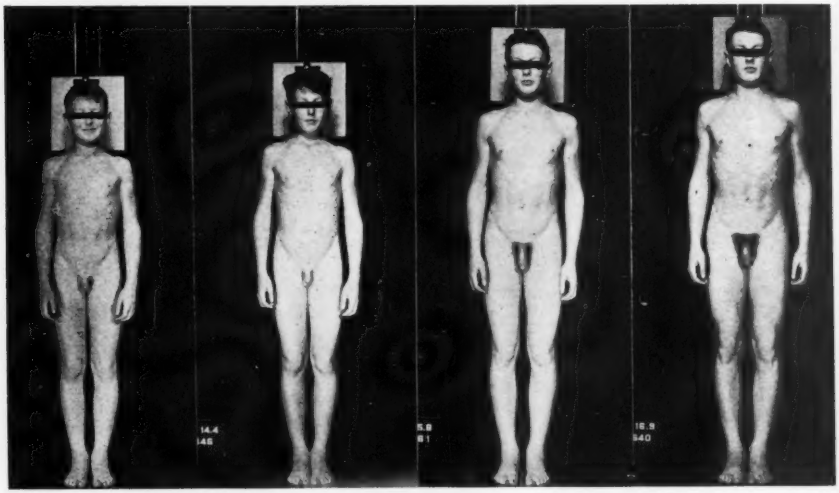


Figure 11d.
A late maturing boy at 13 years, 4 months; 14 years, 4 months; 15 years, 8 months; and 16 years, 9 months.

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Crippled Children,—The Chicago Board of Education supports four elementary and two high schools for crippled children. Bus transportation and lunch are donated. Total costs are $300 more per year to support the crippled than the normal child. Any child whose doctor recommends physical therapy treatment gets it during the school day. Treatment is primarily for poliomyelitis and spastic paralysis. The Journal of Health and Physical Education, January, 1940, p. 46.

CHANGING BODY AND CHANGING SELF*

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Observations in the Study of Adolescents confirm the view of various students of medicine and psychology that physical and psychological factors are interrelated in all behavior. This view of the personality as psychosomatic provides a startling point for the understanding of the educational needs of young persons included in the Study.

Throughout life, but particularly in youth, each person has a concept, more or less consciously, of the self he hopes and fears he will become. This concept of self is virtually indistinguishable from the image of the body, as the individual experiences it. How does this come to be so?

In the first place, for the reason that an individual's original perceptions in infancy and childhood are limited almost exclusively to his body. Sensations, discoveries of his body, comprise his earliest experiences. His mother conveys to him attitudes toward his body which reflect her deep-seated feelings toward her own. He comes to experience his physical lapses from grace as evidences of unworthiness in his total being. It is likely that throughout life, despite radical changes, an individual's concept of self retains something of these initial impressions.

A second reason for the close interrelation of the concept of self with the image of the body is that the body has a realism greater than other aspects of the personality. The body not only has a palpable reality (as thought and feeling have not) but it is the medium of expression of all aspects of the personality. Thus posture and gait, as well as the pattern of the facial muscles, serve to reveal something of the individual's characteristic attitudes.

A third factor which acts to influence an individual in conceiving of his body as symbolic of himself is his knowledge of the impressions of him that are held by those about him. The group—especially outside the family—in appraising an individual, tends to rely too much upon the "portraiture" of total personality provided by physical appearance. This is to be noted especially with reference to adolescents, about whom adults often express expectations of vocational roles in accordance with somewhat stylized concepts of physical appearance: this boy looks like a potential professor; this girl has the earmarks of a future nurse. This tendency to overvalue physical appearance serves to reinforce the adolescent's

*Abstracted by William Schmidt, M.D. From *Emotion and Conduct In Adolescence.* To be published by D. Appleton-Century Co., N. Y. Presented before the American School Health Association, and the Child Hygiene and Public Health Nursing Sections of the American Public Health Association, October 19, 1939 at Pittsburgh, Pa.

inclination, already established, to emphasize the importance of body in his concept of self.

Finally, physical change has concomitants in emotional experience, and the latter is not without repercussions in the functioning of organs. Such interrelationship is markedly evident in the case of illness. Less evident, but no less important, are the emotional concomitants of normal physical growth.

Changes in Growth. Before approaching adolescent's task in adjusting to body changes in satisfying and acceptable ways, it is necessary to survey normal body growth changes together with some common deviations, and their accompanying psychological change.

Maturation of the organism is a process of metamorphosis. Even in a single healthy individual the process is not steady and gradual; it progresses irregularly in time, and unevenly as between the various tissues; the range of normal deviation is wide and it is subject to a variety of influences which result in deviations among individuals.

The most evident aspect of physical development—growth in body bulk—is marked by two major waves, the first in the prenatal and infant period, the second associated with puberty. The rapid increase in body bulk during the intrauterine period is followed, after birth, by a doubling of weight in five months, and a tripling in twelve. Thereafter the rate of increase in bulk slows until puberty approaches, when it again increases and proceeds at a rapid rate for many months. In contrast with this pattern of increase in body bulk, the brain and spinal cord present a strikingly different picture of growth. Having reached one fourth of their adult size at the time of birth, the brain and cord have attained nine-tenths of their full growth by six years. Still another pattern of growth is presented by the thymus gland, which has reached its maximum at 7 years, and is regressing at puberty, when other tissues are rapidly increasing.

The sexual organs, which have grown but slowly in the prepubertal period, develop rapidly during puberty, and with them, the secondary sex characteristics. In the boy there is not only a speeding up of growth in body bulk, but a change in proportions, with a broadening of shoulders and chest. Pubic hair appears, the beard begins to grow, and the voice deepens. The penis and testes increase in size and the production of sperm cells is begun. The physical organism is ready for reproduction, although in contemporary western civilization the boy is as yet far from ready emotionally or socially.

Similar changes occur in the girl's pubertal development so that she is also organically ready for reproduction, although a number of years of social-emotional development usually must intervene before she is ready as a total personality.

If irregularity and unevenness characterize the child's development, by what means can the degree of progress toward adulthood be ascertained? Chronological age is a poor measure of either physical or social maturity. A new means of measuring physical maturity, based on bone development studied by means of X-rays promises to be a reliable index. There is evidence that the beginning spurt of growth and genital development at puberty always occur at a certain point in bone development. At other, less dramatic periods of growth, estimates of "bone age" are especially needed for rating of physical maturity.

Studies of bone development reveal striking differences between normal individuals. Sex differences are well known. Until the chronological age of 5 years, the sexes show similar bone development, but at this time girls forge ahead rapidly. Again at about 10 years and during puberty, girls' bone development is in advance of boys' of corresponding age.

Hereditary factors also play a role. Not only do the yellow, the white, and the black races differ in bone development and stature, but various physical "types", sometimes loosely called races, tend toward characteristic growth patterns. Because of these differences in hereditary tendencies, little may be learned regarding the growth process or the state of health of any one child from his position on a weight for age chart. More can be learned from his health history, observations during past stages of growth, and from his build and that of his parents and relatives.

The glands of internal secretion have an intimate relation to physical growth, and deficiency or excess secretion in one or another may disturb the developmental process. The present state of medical knowledge affords no basis, however, for ascribing to "gland trouble" the large number of variations from human norms that enthusiasts are wont to assign to this source.

Malnutrition, even for relatively short periods of time, impairs the process of growth and development. Moreover insufficient opportunity for abundant rest, as well as lack of outdoor exercise in fresh air and sunshine are factors tending to disturb the growth process.

Thus physical development is a complex process, proceeding unevenly, subject to wide normal variation, and subject to impairment because of malnutrition, environmental hazards, disturbances in glandular function, and disease.

The various changes occurring in the body during adolescence are seen by the young person not as separate specific changes, but rather that he, as a total personality, is very different from his former self. In girl as well as boy physical maturation is accompanied by feelings subtly different from and very likely more intense than those of which either has been aware through childhood. The adolescent is more responsive to the situations in which he

finds himself, and this heightened response sometimes leads to bizarre behavior. He is inclined to be more sensitive to the quality of relationships between adults who are important to him. He is occupied with efforts to understand unaccustomed erotic feelings.

In essence, therefore, one important task of adjustment in which the young person is engaged is that of reorganizing his thoughts and feelings about himself in the light of these significant body changes and their concomitants. In his early years, the child's self-observation centered upon such phases of development as feeding, cleanliness, exploration of his body, use of language. Now the child is approaching maturity, and it is this change, in its turn, which is the object of his interest.

Social-Emotional Problems Related to Organic Growth. Just as each adolescent organism matures in its own time and its own ways, within a wide span that is regarded as normal, so too each young person is unique in the ways in which he experiences and adapts himself to his particular pattern of physical change. Nevertheless these forms of psychological response, for all their dissimilarities, have significant common aspects and thus permit of some useful generalization regarding the various problems that different boys and girls meet in their adjustment to physical change and the ways in which they deal with them.

Tension may be brought about by the mere fact of the growth processes. To the adolescent it may appear that if one's very self is changing, one can be certain of nothing. In most adolescents the striving to attain the developmental level just ahead is strong, but it is complicated in some by the realization that the emotional satisfactions of babyhood are being left behind.

Other boys and girls, having reached adolescence, no longer have a continuing wish for the indulgence and authority of others. Even they, however, are not free from a lingering desire to be coddled, a feeling that emerges especially when they are tired, frightened, or discouraged. This is of course true also in the adult.

Increase in size and strength provides a satisfaction for the adolescent, especially the boy, but it may be accompanied by feelings of bewilderment. Moreover, since size and general contour are an individual's most manifest attributes, even slight deviations in body bulk may cause the adolescent boy or girl serious difficulty. As the adolescent looks about him, he sees that he is different from others, since the growth process varies for each individual. An apprehension may appear that something may be wrong with him.

The adolescent may see any variation in the rate or pattern of his sexual development in an exaggerated form and misunderstand it as an eccentricity. The boy who is early in development finds himself larger and stronger than his contemporaries and must either inhibit most of his normal impulses of aggression or, having expressed them, bring upon himself a burden of remorse. The boy

who is late in pubertal development regards himself among his contemporaries as undersized and underdeveloped and suffers a feeling of inadequacy.

Evidences of sexual maturation may be both feared and welcomed by the adolescent boy or girl, and the possibility of deviations from forms each takes to be appropriate frequently gives rise to anxious speculation on his part. Anxiety will commonly appear in boys and girls who have grown up in families in which the body has been regarded with fear and shame by adults, but may even present itself in the absence of this type of parental influence. The adolescent girl realizes that the changes she is undergoing emphasizes her difference from boys, and this may appear to her as a loss in privilege, since contemporary society does not provide advantages to young girls as it does to young boys. Without having been prepared for the experience, the advent of menstruation, especially if it coincides with anxiety over some other circumstance, may lead to bewilderment, but even with appropriate preparation some girls are disturbed and may continue to be disturbed for a time. However, many girls have been looking ahead with pleasure to their role as women. If they have been carefully prepared for the menarche, they may be reassured by this evidence that they are growing toward womanhood and that their role is at least clearly defined.

In the boy, an impression of under- or over-development (inexact as these impressions may be) will bring with it feelings of inadequacy or unaccustomed heightened feeling which may be accompanied by fear of this manifestation and even fear for himself as a total personality.

The young person in the period of adolescence is attempting to achieve a balanced reorganization of his personality in a situation not only new and strange but in which he experiences a continually shifting asymmetry.

First he may experience a rapid increase in height while other aspects of growth lag, so that he sees himself as disproportionately gangling. Again, a rapid increase in breadth or in one or another of the secondary sex characteristics may emerge as the predominant aspect of growth at a given time. Thus the adolescent may fail to observe that throughout the entire period he has continued to develop in all characteristics although never at an equal rate at any time. Although the growth pattern may have been quite orderly, it is not unlikely that the adolescent may find difficulty in achieving an equilibrium in his thoughts and feelings on unequal changes. A second disturbing element which has been referred to is the circumstance that his growth may seem to be out of line with that of his sex-age mates. A third lies in the relationship of his physical development to other aspects of his personality and their unequal progress. The adolescent who may be physically a young man, may be socially little more than a child, and intellectually somewhere in

between. Finally, the adolescent is influenced and perhaps disturbed by the attitudes taken toward him by adults and by the confusion they may display in expecting him to manifest intellectual development and social responsibility on a level with his organic development.

Adaptations to Organic Growth. The adolescent expresses in various ways emerging attitudes toward himself in achieving his new equilibrium. Through such expression he is normally likely in time to come to terms satisfactorily with his perplexities, although he may be more than usually disturbed and experience serious difficulties.

In physical bearing and activities the adolescent may find an outlet for his feelings. The characteristic posture may reflect the attitude toward the body. Fear of it or overanxious concern may be expressed through rigidity and precision of movement. Pride and pleasure in its physical development is implied in an easy and flowing movement. Boys and girls frequently express their attitudes toward their body more freely and unequivocally while engaged in bodily forms of expression, such as physical educational activities, than in ordinary carriage or posture.

Occasionally, however, undue zealousness in physical activity may result from fears of physical inadequacy. An interesting example of this is provided by the following case history.

A junior high school student of athletic build and erect posture maintains that she feels well although on physical examination she appears to be underdeveloped, underweight, and her menstrual periods are not yet established. At school she excels both in academic work and in athletic activities. Her attainments are admired by classmates and teachers, and she has never been regarded by the faculty of her school as constituting a problem in any way. She exhibits many difficulties of behavior with her family, including violent outbursts of temper and verbal altercations. The mother, who is sick and hysterical, centered her attention upon this child until a second daughter was born, when she manifested a definite preference for the younger baby. The father, aware that his wife's protection of the latter is an important factor in the problem, excuses the mother's attitude on the basis of her poor health, and only reluctantly admits bitterness toward her for her treatment of the older daughter. This adolescent girl feels that she is a misfit at home and that it is hopeless to try to compensate in this atmosphere for the physical retardation, from which arise fears of physical fitness. At school, however, she can win the approval withheld by her family; she can assuage or even push out of sight her own dissatisfaction with her own physique by proving herself superior to classmates intellectually and athletically.

Many boys and girls, however, find a stimulus to the development of healthy attitudes toward their body in athletics, through the school's dance studio, and to a lesser extent the graphic arts such as sculpture and painting. Other forms, such as social dancing, are more closely allied to the adjustment to the opposite sex.

Appearance, especially as manifested in details of dress and grooming, is in large part expressive of interest in body development. Even in school situations in which certain characteristic dress is almost uniformly accepted, wide and significant variations are manifested by individuals in many details. Deviations from

the mode are in many instances expressive of the girls' attitudes toward their bodies. In boys as well, although the fashions may run to carelessness in attire, occasionally great variations are manifested. The use of cosmetics by adolescent girls, and shaving by adolescent boys, are emblems of growing up and means of expressing pride in a more important status.

As phvsical appearance and attractiveness become increasingly a means whereby the young person expresses feelings about the self as symbolized by the body and its significance in social relationships, the presence or absence of an audience is likely to have a sweeping effect on appearance. Thus at a boarding school the observation was made that from Monday to Friday in spite of careful supervision the pupils are apt to be indifferently or even sloppily turned out. On Saturdays, however, they emerge as butterflies from their cocoons. Town pupils, on the other hand, who walk or ride to school each morning usually make themselves quite presentable.

Various interactions between emotional and organic functioning are especially significant in the young person's attempts to adjust himself in bodily change. The adolescent's doubts about his body may focus on some one feature of his physical appearance that has particular meaning to him, such as his size, long feet, a bad complexion, or genital development. In the same way, his doubts may center on a single aspect of his physical wellbeing. For example, a young person who is dealing with anxiety about a mysterious body change may be relieved when he contracts a mild illness upon which he can fix his anxiety without guilt. Many girls give evidence of confusion or conflict regarding their potential biological role, and appear to experience marked physical discomfort during menstrual periods in the absence of discoverable disturbance of the physical process as a primary cause. Anxiety of possibility of pregnancy even without reason may produce some of the symptoms which are being anticipated, noticeably delay in the menses. It must be noted, however, that extreme variability is usual during the first few years of the menstrual function.

Nutritional disorders arising in psychological disturbance are many. It is sometimes evident that the adolescent's response to his parents' anxiety for his health is a balking that prevents his eating as much as he really wants. In some instances, poor appetite reflects a more specific emotional disturbance in which food is abhorrent because of certain associations. Again, the young person suffering from lonesomeness may find a satisfaction through enjoyment of food and tend to overeat. A physical disorder may persist overlong or a series of such disorders may occur, because the young person is reluctant, for reasons obscure at the time, to take proper steps toward treatment.

Of course no one mode of adaptation to bodily development is the sole method that any one young person uses. Directly or indirectly, his feelings are in a measure expressed in all his conduct. A number of patterns of expression of conflicting feelings about physical development have been presented: the day-by-day use of the body, physical activity, attitude toward appearance, and attitudes toward health.

Some adolescents, however, attempt to solve their perplexities for the most part in other ways. The development of social attitudes may be the dominant feature, such as mischievousness, teasing of companions, and habitual commission of nuisances.

A boy of 16½ years was several inches below median height for his age and retarded in general development. His intelligence was just normal in contrast to the rather high class median. His general appearance was that of a lively and alert youngster of 12 or 13. He manifested concern about his state of physical development. He had few companions of his own age and seemed always uncomfortably conscious that they were more advanced than he. He saved his money to buy a patent medicine advertised as a stimulant to growth. The boy disliked school. In the classroom and on the playground he was a general nuisance. At school his adjustment both social and academic, grew progressively less satisfactory until he was suspended from the junior high school for continual class disturbance. At home, however, he was an agreeable child; treated by his parents as a younger boy, he was docile and accepted supervision without resentment. It was learned that delay in physical maturation was characteristic of the father's family. The relationship of his delayed development to glandular function was explained to the boy by the doctor, and it was clarified that this deviation from the more usual pattern was normal to his family. He was given an opportunity to talk over with a guidance worker his feelings about the slowness of his physical development. His parents were encouraged to give him more freedom and responsibility. In the vocational school to which he was transferred he was presented with problems which interested him and which were not too much for him. Although he still is conscious of physical inferiority, his anxiety is considerably relieved both by the evidence of some recent growth and by the reassurance that his mode of development is not abnormal.

Other young people attempt to deal with feelings of physical inadequacy by trying to achieve conspicuous success in some specific field which they believe they may be able to master. It is not unusual for a small, underdeveloped boy to defeat all comers as a boy orator or debater, abetted in many instance by the school.

In the attempt to comprehend and assimilate change so radical as that in which the adolescent now finds himself, he is not unlikely to find his position precarious, and from time to time to believe that his attainment of a new security is threatened. But it is also a pleasure and a stimulus and a source of pride to be growing up.

He may be unable to maintain emotional equilibrium without help. For most boys and girls, however, these problems are not too difficult. If those who are guiding the adolescent understand something of the quality of his experiences in the effort to adjust himself to physical change, they can accept from him occasional behavior which, to outward view, may seem extreme or even unwarranted, and by their understanding can help him in his task of coming to terms with his changing body.

THE ADOLESCENT IN A CHANGING WORLD—A SUMMARY*

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This statement may be justified on the grounds that there is a need for a broader perspective and for some clearer conceptions of adolescence. It seems clear that those who are dealing with adolescent boys and girls in any capacity, and especially those who have responsibility for their health and welfare, must operate with some assumptions and some concepts of what adolescence is, of how adolescents grow and develop. The question is whether those assumptions and those concepts are still valid in the light of present day knowledge and understandings.

In the first place we should see the adolescent in the larger demographic picture wherein we note a persistently declining birth rate and a diminishing infant and child population, with a growing proportion of aged. While the number of babies and children is decreasing very rapidly, the decline in the number of adolescents may not become apparent for another decade or so. Sooner or later, however, we will see diminishing numbers of adolescents and probably a growing concern for their health, education, and recreation. Both pediatricians and public health workers, therefore, may look forward to a situation with fewer babies and more adolescents.

It should also be recognized that the period from ten to fourteen has the lowest mortality of any age period, but that the age period from fifteen to nineteen shows a sudden rise, with the beginning of the adult mortality rate. It should be noted especially that the female death rate is lower than the male at all ages *except during adolescence*. This sudden rise and the excess of female deaths warrant more serious attention by those concerned with school health problems of adolescents.

When we ask what is known about the growth, development, and maturation of adolescents, the answer must be "relatively little," but that a number of longitudinal studies, that is, studies of the same children over a period of years, are under way at Harvard, Yale, Western Reserve, and California[1], and that a four-year study

*Presented to the American School Health Association, and to the Child Hygiene, and the Public Health Nursing Sections of the American Public Health Association, Pittsburgh, Pennsylvania, October 19, 1939.

[1]The Society for Research in Child Development welcomes as members all those who are engaged in child research or in work with children and adolescents. Through biennial conferences and the publication of Child Development Abstracts, Child Development (a Quarterly) and Child Development Monographs it provides members with latest results of study of children. Membership blanks upon application to: Society for Research in Child Development, National Research Council, Washington, D. C.

See also the forthcoming publications of the Progressive Education Association on adolescence beginning with The Reorganization of Secondary Education by Dr. Caroline B. Zachry, Dr. V. T. Thayer, and Dr. Ruth Kotinsky. Appleton-Century, New York, 1939; to be followed by several volumes on personality aspects of adolescence, problems of mental health in high schools, etc.

has just been completed by the Progressive Education Association under the direction of Dr. Caroline Zachry. These studies promise new understandings and insights, and will probably yield many fruitful leads to those who are interested in adolescence. Already they are showing how much that is now believed is without foundation. It is astonishing how much folk-lore and how many unsupported beliefs there are about the adolescent.

There is a very real need today for some basic understandings rather than for detailed facts and figures, and these may perhaps be communicated by allegories that convey a meaning of the situation rather than a series of statistical tables: Suppose that each of us had purchased a Model-T Ford Touring Car in 1919, which we have used daily for the past twenty years, but today we are driving a Rolls Royce 12-Cylinder Limousine: despite the fact that we have used the car every day and have had various and sundry mishaps and accidents, it has gradually been transformed almost without our awareness. However fantastic this analogy may seem, it is no more amazing than the transformation that takes place in human growth, development, and maturation from infancy to maturity. Here we see an organism continually functioning—digestion, assimilation, elimination, circulation, respiration, muscular activity, repair of injury, and recovery from disease,—but changing sometimes rapidly, sometimes slowly in its dimensions, in its functional capacities, and in maturation of mental, emotional, and sexual capacities. These transformations take place rapidly in infancy, followed by a slower phase in childhood, and then again rapid change, and then a slower phase to adulthood.

Many years ago Fisk called our attention to the significance of the prolonged infancy of man. Today we are beginning to realize that man also enjoys the longest adolescence of any species. While this slow and prolonged period of development provides the opportunity for the greater development of man, we must not forget that it also involves exposure to distortion and organic imbalances and skewed development.

From current investigations of adolescent development certain pictures or concepts are beginning to emerge. It is evident that there is an orderly process of development and maturation, a well-marked road from childhood to adulthood. But while there are these regular recurrent patterns, it is clear, from the studies of *individual* boys and girls followed through the adolescent period, that each one travels along this road or undergoes this orderly process of development, (a) at different rates of progress or change, and (b) with different quantitative structural and functional expressions, or by attaining dimensions of different structures that are appropriate to his or her organic constitution. Here again it may be useful to invoke an analogy to make the meaning of these statements more clear: Imagine, if you please, a hundred boys

and a hundred girls who are going to travel from New York to Chicago. A few will go by airplane, some by the Twentieth Century Limited, others on a bus, others will hitch-hike, and others will very leisurely walk the whole way. They will all reach Chicago sooner or later, but some will get there long before the others, seemingly maturing very rapidly. But be it noted that the children who mature most rapidly are not necessarily those who have the largest dimensions. Indeed, it has been shown that the short, broad girls mature early whereas the tall, thin girls mature late[2], and this probably also applies to many boys. It is also being discovered that the menarche, or the beginning of menstruation, shows wide variation in the time of onset, some beginning quite early, some quite late. Moreover, it appears that following the first menstruation a girl may need one or two years or more before she has *"learned"* to achieve any regularity of function, and that regularity is always relative, as we are beginning to see. Again, it is becoming clear, that there is probably a lag of several years before ovulation begins. There are wide variations in the functional efficiency of the different endocrine organs and frequent imbalances among the different hormones, some of which are temporary phases of adolescent development, while others are persistent disturbances requiring medical treatment. The diagnosis of such cases involves a developmental scrutiny of the individual case.[3]

Here it is important to try to get a clearer picture of what puberty and adolescence mean. These terms are used more or less interchangeably, and sooner or later we will have either to give them some more definite meaning or to use new terms to denote the sequence or process of development. It appears that somewhere around nine years of age the developmental processes begin which are registered some years later as puberty. It cannot be too strongly emphasized, therefore, that skeletal changes, gonadal maturation, and the whole series of related events are taking place *before* puberty or the menarche; these may be of great significance for the individual's future health and normal functioning. For the most part, however, they are either neglected or ignored because our interest has been focussed upon the more or less dramatic events that might be said to characterize the end of this particular phase of development.

It should also be realized that both these pre-pubertal and the post-pubertal changes may not be coordinated or organically har-

[2]Cf. Pryor, Helen B., M.D.; and Carter, Harold D., Ph.D. Phases of Adolescent Development in Girls. *California and West. Med.*, 1938, 48, 89-94.

See also the Child Development Monographs, especially the studies by Frank Shuttleworth.

Engle, Earl T. and Shelesnyak, M.C. First Menstruation and Subsequent Menstrual Cycles of Pubertal Girls. *Human Biology*, 1934, 6, 431-453.

[3]Cf. Greulich, W. W., et al. A Handbook of Methods for the Study of Adolescent Children. *Monog. Soc. Res. Child Dev.*, 1938, 3, 406 pp.

monious; for example, we may see a boy around fourteen or fifteen years of age almost suddenly attain a stature of six feet-plus. Despite this adult stature, however, he may and frequently does have a cardiovascular and a gastrointestinal system, a muscular development, a gonadal development, intelligence development, and a degree of emotional control that are still juvenile. Here we see the necessity of examining very critically all proposed norms, such as height-weight charts or the I.Q. and other standardized tests, built on age norms, since the individual boy or girl of a given chronological age may have developed or matured precociously, or belatedly, or asymmetrically.

What this means is that adolescence is frequently a period of organic incongruity, when the individual child is attempting to live with organ systems and functional capacities of varying levels of maturity. This imbalance or incongruity may impose great stress and strain, especially when the child, as so frequently happens, attempts to live up to the most accelerated structure or function. As we get a better understanding of this uncoordinated development that so frequently characterizes the adolescent boy and girl, we will become increasingly skeptical of age norms for any structural or functional or behavior characteristic. Chronological age, which has heretofore been assumed to be a basis for grouping children, is now seen to be perhaps the least significant aspect of a child. Moreover, we are beginning to suspect the older assumption that functional capacities were dependent upon the size of a child or of individual organs. Already it is clear that dimensions and functions may be unrelated, and that an adolescent who is growing slowly but in a rounded, coordinated fashion may be functionally much more efficient and competent than a child who is much larger, but is organically uncoordinated. These points should be emphasized because of the apparently well established ideas to the contrary that are held not only by the layman but by many educators and others engaged in health work with adolescents. Without wishing to suggest too radical a revision of our thinking, it would not be inappropriate to say that it is the large, tall boys and girls whom we need to watch most closely, as probably most susceptible to stress and strain and disaster because their precocious stature may not be accompanied by commensurate development of organ systems and functional capacities.

There is another aspect of adolescent development now emerging from recent studies of child development, namely: that growth and physiological stability are not compatible, or, in other words, whenever we have an organism that is rapidly growing it will necessarily be unstable, because otherwise growth could not take place. If we will reflect a moment we will see how this principle must obtain because the changing dimensions through which growth

occurs precludes any steady, stable functioning of the growing organism.[4]

While we cannot make any dogmatic statement in this connection, nevertheless it may be useful to think of adolescence as a period of second infancy, in the sense that the organism is undergoing very rapid growth, and is subject to physiological instabilities. Perhaps this way of looking at adolescence may give us some clues to the many defects, maladjustments, and difficulties we see in adolescent boys and girls, and lead us to regard these as symptoms of this physiological instability and the inadequacy of nurture, particularly nutrition. Perhaps we will discover that many rapidly growing adolescents are suffering from what might be called *adolescent rickets* and other deficiency diseases that arise from the increased demands for vitamins and minerals during this period of rapid growth and of maturation of organic systems.

This view of adolescence as a period of rapid growth and of organic imbalances, suggest that this period of life offers a golden opportunity for preventive medicine, since this is the last chance to modify the growing organism before it freezes, so to speak, into the adult steady state. Preventive medicine during the adolescent years is not so much a matter of diagnosis and therapy as it is the question of providing the regimen of nutrition, rest, activity, and release, which will help the individual boy and girl to achieve maturity with a better organic balance and coordination and functional efficiency. But such a preventive medicine must recognize individuals and individual growth patterns, and not be misled by age norms that may prove damaging to individuals who are not close to the average or model pattern.

Medicine and public health have more to contribute to secondary education than physical examinations and correction of defects. Indeed, one wonders whether the preoccupation with the diagnosis and correction of defects may not be obscuring the more important problems of preventive medicine. If we were to look upon those defects as symptoms of inadequate nurture, of asymmetric or skewed development, would our interest be focussed primarily upon their "correction" or upon the modification and improvement of the developmental process that has been skewed or distorted to produce some of these defects? Again, it has been pointed out, the adolescent is generally subject to anxiety about his or her own body and adequacy of functional capacity, and therefore much of our present programs of health education and physical examination may be directly increasing that anxiety, and, what is more, building up increased resistance to the very educational program that we are striving to communicate. It is generally conceded that the courses in hygiene and physical education, however excellent the content

[4]Cf. the writer's paper. The Problem of Child Development. *Child Dev.*, 1935, 6, 7-18.

and presentation, are not making a lasting impression upon the young people who take such courses, possibly because of the emotional reactions to these topics.

Is it unjustified to ask that medicine and public health undertake to foster the clinical attitude in education that recognizes the individual boy and girl as a unique individual with a life history, for whom we should attempt to provide an educational program and a regimen of life designed to meet his or her individual needs? It should be emphasized that it is not enough for teachers, physicians, and nurses to recognize individual differences, since the most difficult task of all is to help the individual to accept his or her own individual differences without anxiety or the other emotional disturbances which recently have been described.[5] Is it putting too much of a burden upon medicine and public health to ask that they be the agents through which the new knowledge of adolescent growth and development be focussed upon the educational system? Such a responsibility would perhaps lead to a more critical scrutiny of the whole educational system, the buildings, the equipment, the staff, the schedule, and the daily programs as either threats or benefits to growing, maturing adolescents. With such an attitude perhaps we might discover that there are "educational diseases," just as we have discovered that there are occupational diseases, i.e., illnesses and dysfunctions that may be directly attributed to the conditions of life to which adolescents are subject in schools. Here let us recall the terrific pressure that is put upon boys and girls between ten and fourteen to graduate from grammar school and prepare for high school, with complete disregard of the organic stress and strain that they may be undergoing during this pre-pubertal period.

Perhaps it is not justified to state the situation in this extreme fashion, nevertheless there is some reason for saying that there is an obligation on the part of school physicians, school nurses, and public health officers to protect adolescents from educational exploitation and the neglect of individual needs. If they do not accept this responsibility then who is to be the guardian and protector of the adolescent boy and girl? Who is to be responsible for trying to bring some balance into our educational programs? Not long ago, in a discussion of the question of how much money might justifiably be spent on nutrition and health service in high schools, it appeared that an expenditure of $2.00 per annum per pupil was looked upon as exorbitant but that $20 to $30 per annum per pupil for English, or mathematics, or Latin, was looked upon as entirely justified. From the point of view of public health or preventive medicine and the future life of the adults who have to carry the major burdens of

[5]Cf. Progressive Education Association publications supra.
Cf. also Keliher, Alice. *Life and Growth*, Appleton-Century, New York, 1938.

life, including the provision of the children of the future, can this disparity be wholly justified?

Thus far we have talked largely about the growth and development of the adolescent as a maturing organism, but we must also recognize that these adolescents are also faced with confusion, conflict, and disorder in social life, in family life, indeed in our whole culture. We are just beginning to realize that as individuals we do not know what to do with our lives, and therefore we must look to our cultural traditions as expressed in art, religion, philosophy, and science to tell us what to believe, how to act, and how to feel toward life. Today we have no clear-cut ideas, concepts, and beliefs because we are all in a state of confusion. We are all living in many centuries, using twentieth century technology, nineteenth or eighteenth century ideas of politics and economics, sixteenth century or earlier ideas of psychology, while many of our basic beliefs and ideas of cosmology and biology are even earlier. The older certainties about the universe, how it was created, how it worked, about man's place in that universe, about his place in and relationship to group life, as expressed in roles of men and women, his rights, titles, interests, and obligations, and the older conception of human nature and conduct which guided our parents and grandparents are confused and conflicting today.[6] Therefore every individual is affected; especially the growing adolescent, who is seeking some design for living, is anxious, perplexed and insecure as he tries to meet the difficulties of becoming an adult, free from dependence upon, or continued control by, his family; to assume the role of adult male or of adult female and prepare for mating and parenthood; to come to terms with present-day social life and meet the urgent demands and baffling perplexities of such life today.[7]

Until recently it was believed that sanity was something that, by some mysterious process or affliction, we lost. Today we are beginning to realize that sanity is something we must achieve by meeting the persistent tasks of life in some fashion that is compatible with the opportunities offered us and with the capacities we individually bring to those tasks. But no one can grapple with those life tasks alone and without guidance. Thus the young boys and girls who are growing up today are, I believe, handicapped by the lack of any clear-cut conceptions and beliefs or directions for their lives and unduly burdened by failure of sympathetic understanding from teachers and other adults.

You may ask: What has this to do with your problem? It has a great deal to do with the problem of adolescent health and particularly with mental hygiene when we begin to recognize how much

[6]Cf. the writer's paper. The Task of General Education. *Social Frontier*, 1937, 3, 171-173 and 209-211.

[7]Cf. the writer's paper. The Reorientation of Education to the Promotion of Mental Hygiene. *Mental Hygiene*, 1939, 23, 529-543.

of ill health and dysfunctions, of unhappy, maladjusted living are really symptoms of this social and cultural confusion as they are felt by the individual boy and girl. As we begin to understand how persistent anxiety, guilt, resentment, and hostility may be released either in behavior disorders, or in mental disorders, or in organic dysfunctions, then we must begin to think in terms of psychosomatic illness.[8] When we see an individual who is ill, who is not functioning adequately, we must begin to ask how much emotional stress and conflict, especially in adolescence, may be either responsible for that illness or be increasing its severity.

We are also beginning to realize that much of what we call delinquency and crime and sex offenses, of marital conflicts and divorce are also symptoms of fundamental personality disorganization and emotional or affective conflicts for which the individual has to find some release. Those engaged in Public Health and school health work cannot ignore this situation, because the same underlying social and cultural conflicts that give rise to individual illness are involved in these more overt social maladjustments which, to a very large extent, are social problems awaiting preventive medicine. Does this not suggest, therefore, that public health and preventive medicine may have to seek a broader concept of their responsibilities and their opportunities? Just as they have shown how in the case of typhoid fever, tuberculosis, various deficiency diseases, and occupational diseases, we must look at the social and environmental situation which gives rise to these diseases; so they must begin to look into the underlying social and cultural situation that fosters these disorders, dysfunctions, and distortions.

In the field of public health, probably there will be a progressive recognition of the need for assaying our social life and practices and our basic cultural patterns in terms of their human consequences: of what they do to the health and sanity, the fertility, the maternal health, and the duration of life of members of our society.

This brings us back to the earlier point in this discussion, namely, that those who are concerned with child health in any form are guided by certain ideas and conceptions, certain beliefs, about growth, development, and maturation of children and adolescents. Are those ideas still valid or are they already obsolete in the light of the new knowledge that is coming from child research? With this new knowledge and understanding of child growth and development, medicine and public health can increasingly undertake to protect youth and help to build toward a decent human society and a culture that is dedicated to human conservation. To recognize and protect the individual as a unique individual may be one way in which medicine and public health can help to demonstrate the basic meaning of what we call the democratic way.

[8]Cf. Dunbar, H. Flanders. *Emotions and Bodily Changes*, second edition, Columbia University Press, New York, 1939.
See also the new Journal *Psychosomatic Medicine*.

EDITORIALS

The major portion of this Journal is devoted to articles on various phases of adolescence.

What is adolescence? Many have attempted an answer, some of these answers being books of hundreds of pages. Roughly, we may say it is that phase of life during which the child largely finishes the job of becoming an adult. It is a complex of mental, sexual, physical, and social development, each of these progressing at variable rates, and each, in turn, seeming to occupy the center of the stage. Even the physical growth period itself shows amazingly ingenious ways of alterations. The articles themselves describe and illustrate the fact that adolescence cannot be tightly bound by age limitations except within extremely broad ranges.

On the physical side, there are considerable evidences that we in northern America are undergoing a rapid increase in stature. According to one careful study college girls average 1.1″ taller and 7.25 pounds heavier than their mothers. Sons are 1.4″ taller and 8.15 pounds heavier than their own fathers. Are these increases in stature advantageous? How large should this race of ours be to function at its best?

Are we becoming more intelligent? Some statistics indicate that the percentage of psychoses and of feeblemindedness is increasing. How much of this seeming increase is due to the more complex and nervously exhausting environment in which we try to live? Professor Hooton seems to feel that civilized man is breeding himself down-hill. Certainly we know that the families of lower intelligence have, on the average, more children than do families of a higher intellectual status. Many studies indicate an increasing instability in mental balance. Is this due to less real mental poise, or is it because our young people are kept in a continuous state of excitement by their environment? In school, auditorium periods, after school activities, and a speeded up social life keep him in a continuous "whirl". Outside of school, movies, automobiles, radios, and a trash literature keep him in a constant state of raucous excitement.

Do we not have too many and too intensive "programs"? What has become of the third of the twenty-four hours that was to be devoted to "rest and refreshment"? School teachers and administrators, as well as parents, might profitably give thought to the need of great care that the delicate balance, which nature is trying to establish and maintain during the rapidly changing and developing years of adolescence, be not upset.

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While we are on the subject of adolescence, may we return to a subject on which articles and comments have previously appeared in the Journal — the rules that permit too strenuous basketball.

Frequently, there appear reports and criticisms of the rule change that removed the center jump following a field goal. Physicians, health officers, coaches, and sports writers have taken a stand against the present rules. The game is too strenuous, probably, for college players, unless the squad is large enough to permit frequent substitution, and it is certainly detrimentally strenuous for adolescent boys—high school players.

Since only the rule makers seem to favor the present rules, it devolves upon those who are truly interested in the physical welfare of boys to bring pressure upon these rule makers to compel them to adopt changes that will give more opportunity for "breather" periods, so that the circulation may have greater opportunity to remove the waste products of vigorous exercise and thereby to lessen the strain on the heart.

Not only is it a matter of common observation by those who witness games that the game is too strenuous, but reports from physicians, based on actual examinations and studies, show that the present rules result in chronic increased blood pressures and other evidences of serious harmful results.

Every school physician, health officer, and school administrator should insist upon modification. Failing to get modification the high schools themselves should adopt a set of rules of their own. There is no sensible reason why secondary school athletics should follow humbly at the heel of college athletics.

The persons who represent the National Federation of State High School Athletic Associations to whom expressions of disapproval of the present set up should be addressed are as follows: M. C. Cunningham, High School, Desloge, Mo.; Frank P. Maguire, Dept. of Public Instruction, Harrisburg, Pa.; H. V. Porter, 11 South LaSalle St., Chicago, Ill.; Floyd A. Rowe, Board of Education, Cleveland, Ohio.

While these four do not actually make the rules, they no doubt could bring pressure enough upon the Rules Committee so that sensible changes might be made.

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MEETINGS

The Western Branch, American Public Health Association, will hold its eleventh annual meeting in Denver, Colorado, June 23-27, 1940.

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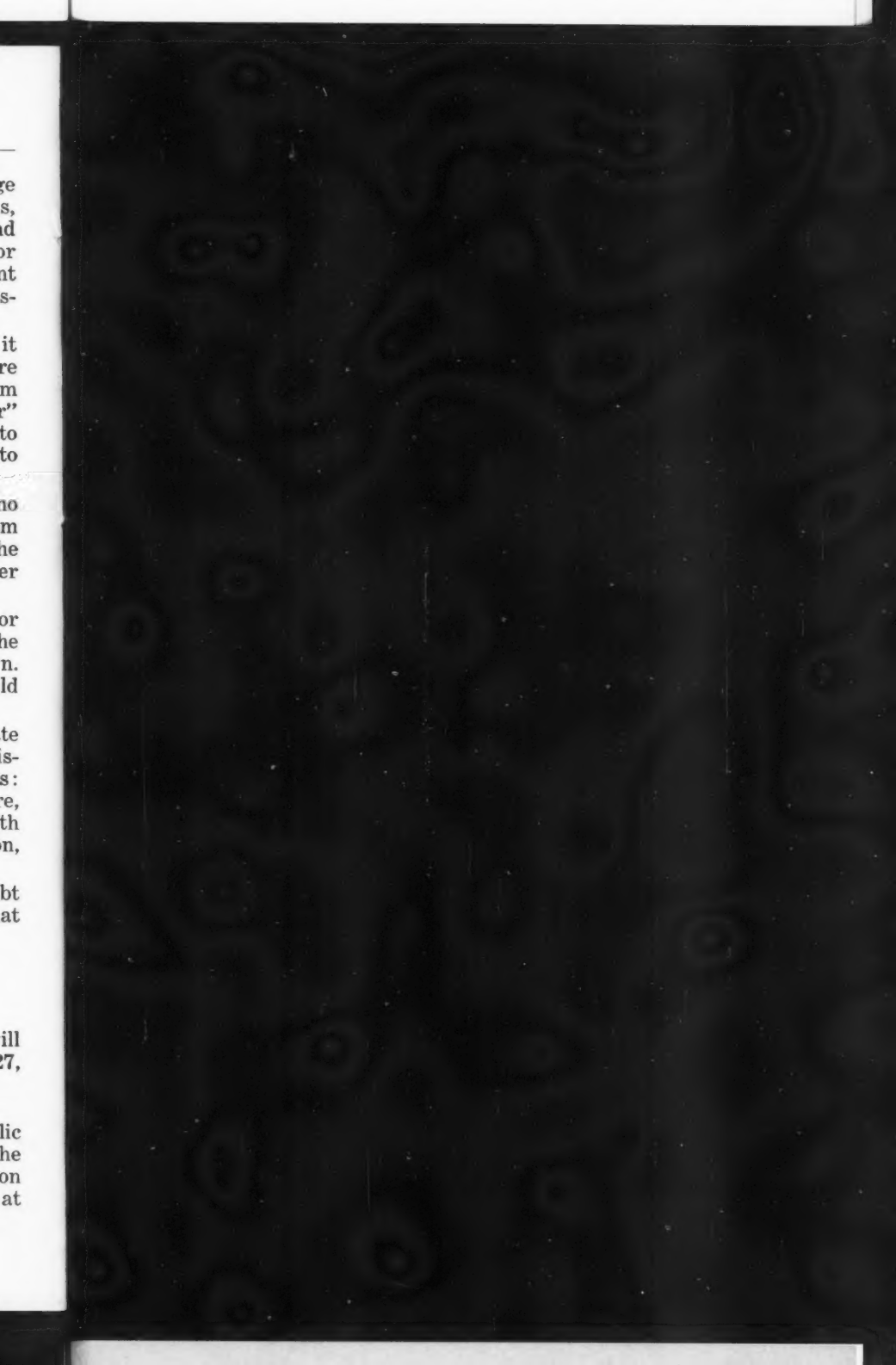
The American School Health Association, the American Public Health Association, the Michigan Public Health Association, the International Society of Medical Health Officers, and the Association of Women in Public Health will hold their next annual meeting at Detroit, Michigan, October 8-11, 1940.